

Considerations on 100m objectives for B400G

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Introduction

This presentation contains considerations on potential objectives for 100 m applications in the B400G Study Group.

These are intended to initiate and support discussions on this topics towards the creation of suitable objectives to support the 100 m application space.

Considerations already made on applications other than 100 m

In [welch_b400g_01a_210208](#) the following potential objectives for SMF applications were suggested:

- 500m over four fibers with 3dB loss budget (per direction)
 - Example: 800GBASE DR4
- 2km over one fiber with 4dB loss budget (per direction)
 - Example: 800GBASE FR4
- TBD km over one fiber with 6dB loss budget (per direction)
 - Example: 800GBASE LR4 x
- Additional Consideration: 2km over four fibers with 4dB loss budget (per direction)
 - Example: 800GBASE DR4+

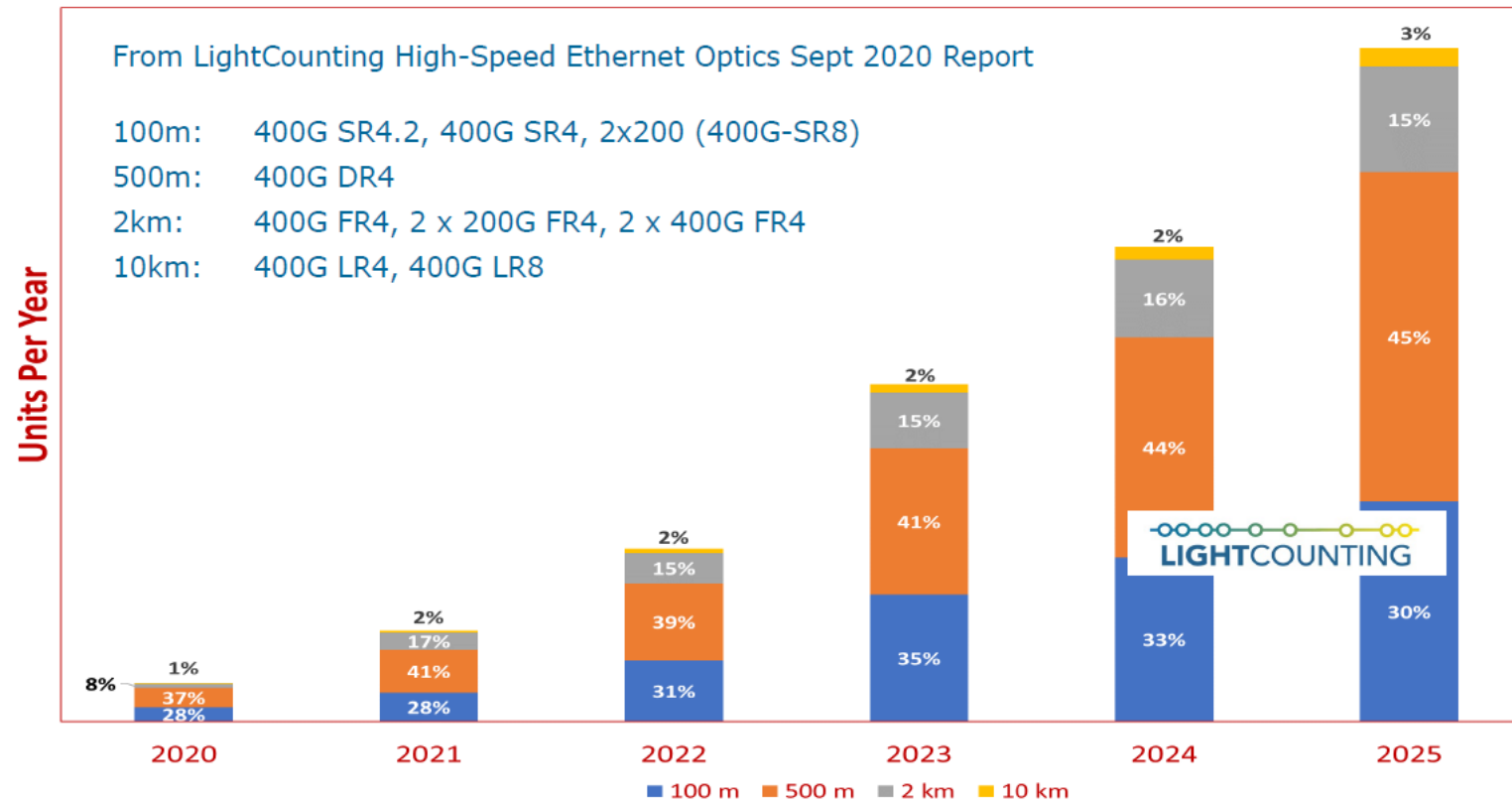
Observations:

- These options are all based on 4 lanes, each operating at 200 Gb/s.
- Addressing distances equal to or larger than 500 m.
- 200 Gb/s per lane on SMF assumed technically & economically feasible.

Expected market volumes

In [dambrosia_b400g_01_210301](#) the following information was shown:

Forecast – Transceiver Modules Targeting 200 GbE or 400 GbE



Market volume for 200G & 400G 100 m applications is significant

Existing 100 m PMDs and those under development

In previous projects the 100 m application space was always addressed by an objective specifically mentioning the usage of MMF fiber.

Existing PMDs:

- 802.3bs: 100 m PMDs over MMF were defined based upon 25 Gb/s NRZ per lane and per MMF.
- 802.3cd: 100 m PMDs over MMF were defined based upon 50 Gb/s PAM4 per lane and per MMF.
- 802.3cm: 100 m PMDs over MMF were defined based upon 50 Gb/s PAM4 per lane and per MMF, plus one for 2 wavelengths over one MMF.

Under development:

- P802.3db: both 50 m and 100 m PMDs based upon 100 Gb/s PAM per lane and MMF fiber.

Author's understanding of MMF technology

- Technologies at speeds up to 50 Gb/s PAM4 are sufficiently technically and economically feasible to support a single PMD over 100 m of MMF.
- At speeds of 100 Gb/s PAM4 solutions over 50 m of MMF are assumed to have optimum technical and economical feasibility, while solutions over 100 m MMF are technically feasible but the cost increase is non-negligible.
- This is evidenced by the discussions in the P802.3db Task Force around the creation of objectives for both 50 m and 100 m applications.
- Operating MMF at 200 Gb/s per lane probably not “trivial”.
- Technical and/or economic feasibility of operation over any distance on MMF at 200 Gb/s per lane will need to be investigated.

Options to address 100 m application space

- One could address 800 Gb/s Ethernet applications over 100 m by 8 lane MMF solutions and 1.6 Tb/s Ethernet applications over 100 m by 16 lane MMF solutions, each operating at 100 Gb/s.
- These do not seem the desired and most effective approach.
- Alternatives:
 - Address 100 m application space by 500 m SMF solutions @ 200 Gb/s per lane, thus 4 lane solutions for 800 Gb/s Ethernet and 8 lane solutions for 1.6 Tb/s Ethernet.
 - Or develop SMF solutions @ 200 Gb/s per lane, cost optimized for 100 m.

Considerations on 100 m over SMF @ 200 Gb/s

- Generally all 500 m SMF PMDs, the so-called DR series, are based upon a channel insertion loss of ~3 dB.
- Reducing the maximum distance from 500 m to 100 m would seem to “save” only ~0.2 dB.
- Seems not sufficient to be sufficiently distinct from 500 m specifications, with 0.2 dB same order as measurement accuracy.
- However, MMF channel insertion losses for 100 m applications are generally specified just under 2 dB (1.8 dB to 1.9 dB).
- With 0.4 dB/km for SMF versus MMF loss max 3.5 dB/km this could be translated to 1.5 dB to 1.6 dB channel loss for 100 m SMF.

Assumptions on CSD distinct identity

- The whole concept of “distinct identity” in the CSD may not be sufficiently clear to (new) attendees to 802.3.
- For optical PMDs, does it mean that we can/can't have 2 different specifications to satisfy the same application/distance?
- For instance: if there would be an objective for a certain distance can we create two PMDs, one with $m \times 200$ Gb/s and the other with $n \times 100$ Gb/s, both for the same distance?
- Could we have an objective for x m for MMF and another for e.g. 100 m of SMF? To be discussed.

Closing suggestions for B400G Study Group

Investigate:

- Technical and economic feasibility of operation over any distance on MMF at 200 Gb/s per lane.
- Whether a channel loss of around 1.5 dB to 1.6 dB for 100 m SMF applications operating at 200 Gb/s per lane/fiber will support development of solutions with sufficiently lower cost compared to solutions developed for 500 m SMF applications.

Thanks!